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# Diel and Seasonal Occurrence of Pink Shrimp, Penaeus duorarum Burkenroad, in Two Divergent Habitats of Tampa Bay, Florida

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# Diel and Seasonal Occurrence of Pink Shrimp, Penaeus duorarum Burkenroad, in Two Divergent Habitats of Tampa Bay, Florida

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## ABSTRACT

Pink shrimp, Penaeus duorarum, were sampled for 17 months in two divergent habitats in Tamp Bay, Fla. Information was obtained on size and sex of the shrimp, water temperature, salinity, light transmission, and activity in relation to moon phase. Catches were larger during darkness and rose as temperature decreased from about 30° C. to 14° C. Larger shrimp were caught in darkness than in daylight throughout the period. Larger shrimp were also caught at the station having lowest salinity and incidence of transmitted light. In dark phases of the moon greater numbers of shrimp were caught than during light phases. The size of shrimp reached a peak in April and May after an average increase in length of about 1 mm. carapace length per month. Female shrimp were larger than males in all samples except two.

## INTRODUCTION

The pink shrimp, Penaeus duorarum, is one of three principal penaeids caught in the Gulf of Mexico and along the southeastern coast of the United States. It supports a sizable bait-shrimp fishery in Tampa Bay, Fla., and is occasionally harvested offshore near the Bay (Saloman, 1965). This report results from ecological investigations in Tampa Bay and concerns some of the habits of pink shrimp and their abundance in relation to biological and hydrological factors. The importance of understanding inshore behavior and development of young shrimp lies in the fact that estuaries serve as nurseries for shrimp which as adults support offshore commercial fisheries. The significance of the estuary in the life cycle of certain penaeid shrimp is widely recognized.

Diel sampling was undertaken at two Tampa Bay stations representing different types of habitat. The Egmont Key station (fig. 1) is in relatively clear water, has a depth of 4 to 6 m., and swift tidal currents (1.5 knots; U.S. Coast & Geodetic Survey, 1951). Mean salinity was 33.2 p.p.t., and the range was 29.3 to 35.2 p.p.t. Attached vegetation (Thalassia testudinum and Syringodium filiforme) was abundant in each sampling period, but the plants became partially defoliated during the winter. Bottom sediments were a fairly uniform

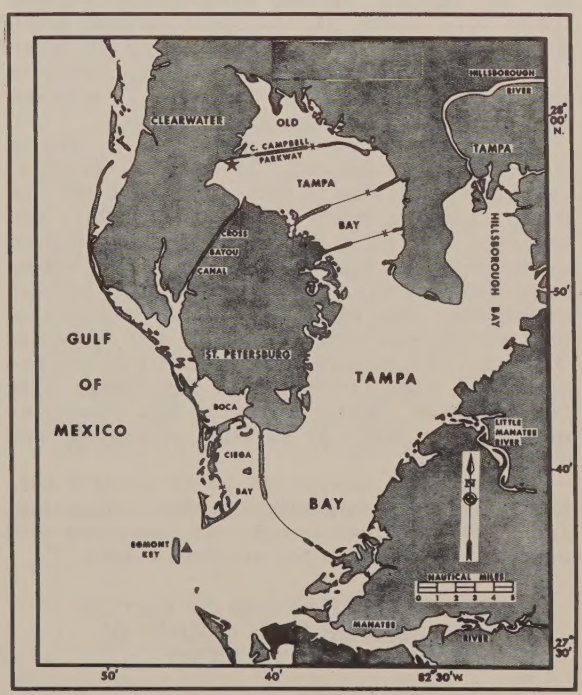


Figure 1.--Sampling stations in Tampa Bay, Fla.--Egmont Key (triangle) and Old Tampa Bay (star).

Table 5.--Number, size (carapace length, millimeters), and sex of pink shrimp caught in Old Tampa Bay, Fla., at difference hours

| Sex and item | Time | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 9000 | 1200 | 1500 | 1800 | 2100 | 2400 | 0300 | 0600 | 9000 | Total |
| Females | | | | | | | | | | |
| Number..... | 16 | 13 | 16 | 22 | 50 | 53 | 66 | 17 | 8 | 261 |
| Mean length.. | 13.7 | 19.5 | 19.4 | 19.7 | 20.0 | 18.6 | 20.6 | 17.9 | 20.1 | 19.3 |
| Range..... | 8.7-26.8 | 10.7-33.7 | 11.0-29.4 | 10.2-31.3 | 5.5-30-4 | 9.1-34.3 | 8.7-31.8 | 11.2-27.0 | 14.9-26.3 | 5.5.-34.3 |
| Males | | | | | | | | | | |
| Number..... | 14 | 5 | 7 | 9 | 45 | 31 | 57 | 20 | 5 | 193 |
| Mean length.. | 11.7 | 16.2 | 16.9 | 17.7 | 16.6 | 16.2 | 19.3 | 16.0 | 13.8 | 16.9 |
| Range..... | 7.3-20.1 | 9.0-24.1 | 13.2-19.9 | 10.1-30.1 | 8.6-24.3 | 8.6-26.3 | 9.3-27.2 | 11.8-19.7 | 8.0-21.5 | 7.3-30.1 |

salinities on a few occasions and concluded that size was related more closely to locality than salinity. This finding is not in agreement with other reports on size in relation to location and salinity of an estuary. Gunter, Christmas, and Killebrew (1964), Williams (1955a, b), Tabb, et al. (1962), and Saloman (1965) concluded that an increase in shrimp size usually accompanies an increase in salinity. Obviously the relative influence of various factors on the size of shrimp captured will not be easy to determine.

The 16 sampling series were conducted during periods of moon phases as follows: new moon, 11 series; first quarter, 2; full moon, 2; and last quarter, 1 series. Although cloud cover at night was not recorded and results are not conclusive, greater numbers of pink shrimp were caught during the dark phases (new moon, first quarter, and last quarter) of the lunar cycle than during the light phase (full moon)--table 6.

Various authors have mentioned that availability of pink shrimp varies with moon phases--that more are caught during the dark or new moon phase (Iversen and Idyll, 1959; Fuss, 1964; Idyll, Iversen, and Yokel, 1965). Perhaps the greatest effect of the moon on shrimp behavior is through the intensity of light (Wheeler, 1937; Fuss and Ogren, 1966). In that event a correlation between catch and moon phase would be expected since light intensity in the first and last quarters is only one-ninth of the moon's total intensity.

Table 6.--Pink shrimp caught at Egmont Key and in Old Tampa Bay, Fla., (data combined) during various moon phases

| Moon phase | Diel samples | Total shrimp | Mean sample |
|---|---|---|---|
| | Number | Number | Number |
| New..... | 11 | 781 | 71 |
| First quarter.. | 2 | 173 | 86 |
| Full..... | 2 | 88 | 44 |
| Last quarter... | 1 | 191 | 191 |

## SEASONAL CHANGES IN ABUNDANCE AND SIZE OF PINK SHRIMP

The mean size (CL) of pink shrimp caught in Tampa Bay showed an average increase of 1.2 mm. per month from August 1962 through May 1963 (fig. 3). Small shrimp started to appear again in June and July. The mean size at Egmont Key steadily increased from July to mid-December 1963. In Old Tampa Bay mean sizes increased from a low of 5.5 mm. CL in June to 19.5 mm. CL in August 1963 and then decreased slightly.

Growth rates at Egmont Key were similar in both years; shrimp gained about 0.7 mm. per month from August through December 1962, and 0.4 mm. per month from July through December 1963. The size increase was greatest from December 1962 through May 1963 when the rate was about 1.5 mm. per month. Mean sizes of pink shrimp at Egmont Key caught during October through December of both 1962 and 1963 were almost identical (fig. 3).

Mean size of pink shrimp reached a peak at both stations in April or May but decreased sharply by June or July (fig. 3). The absence of large pink shrimp in Tampa Bay in June, after a gradual increase ending in April and May, appears to have resulted from the movement of shrimp to offshore waters. Eldred, et al. (1961) found that larger shrimp (85-140 mm. total length) migrated out of Tampa Bay from April through July. Commercial shrimp boats seen offshore by Eldred, et al. (1961) in 1958, by Saloman (1965) in March and April 1963, 1964, and 1965, and by the author again in 1966 also give evidence of a migration from Tampa Bay in the spring.

Catches of pink shrimp increased as temperature decreased to 14° C., but declined at temperatures below this level (fig. 4). Eldred, et al. (1961) and Williams (1955a) suggested that pink shrimp remain in the sediment during cold periods, and Williams also mentioned

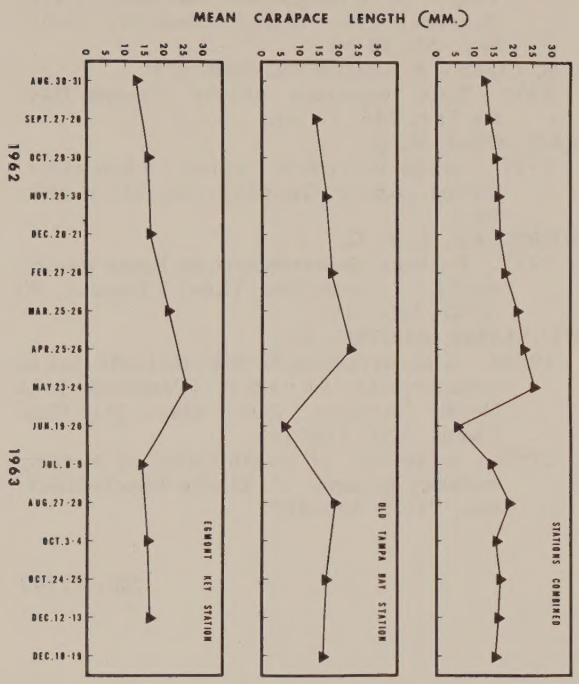


Figure 3.--Mean size of pink shrimp caught on different dates in Old Tampa Bay and at Egmont Key, Fla.

that they become more active and numerous in a given area when water temperature had risen to 15° C. Fuss and Ogren (1966) found that they tend to remain burrowed at temperatures below 14° C. and to show an activity ratio of 50 percent or less regardless of light levels or moon phase. Tabb, et al. (1962) suggested that they might move into deeper water.

Catches also varied between stations by month (tables 1 and 2). In general, catches were lowest in the spring and early summer, and peaks generally came in the fall and early winter.

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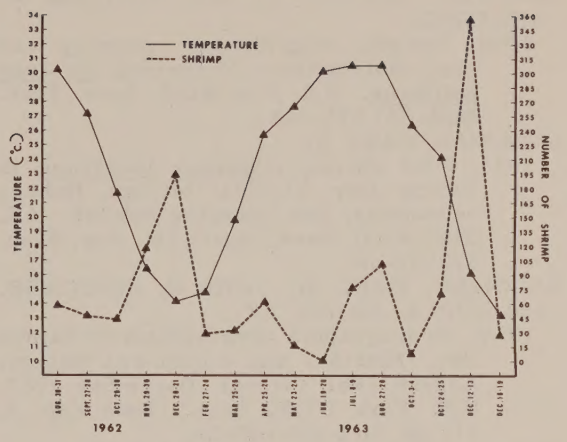


Figure 4.--Number of pink shrimp caught in Old Tampa Bay and at Egmont Key (data combined) in relation to temperature.

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